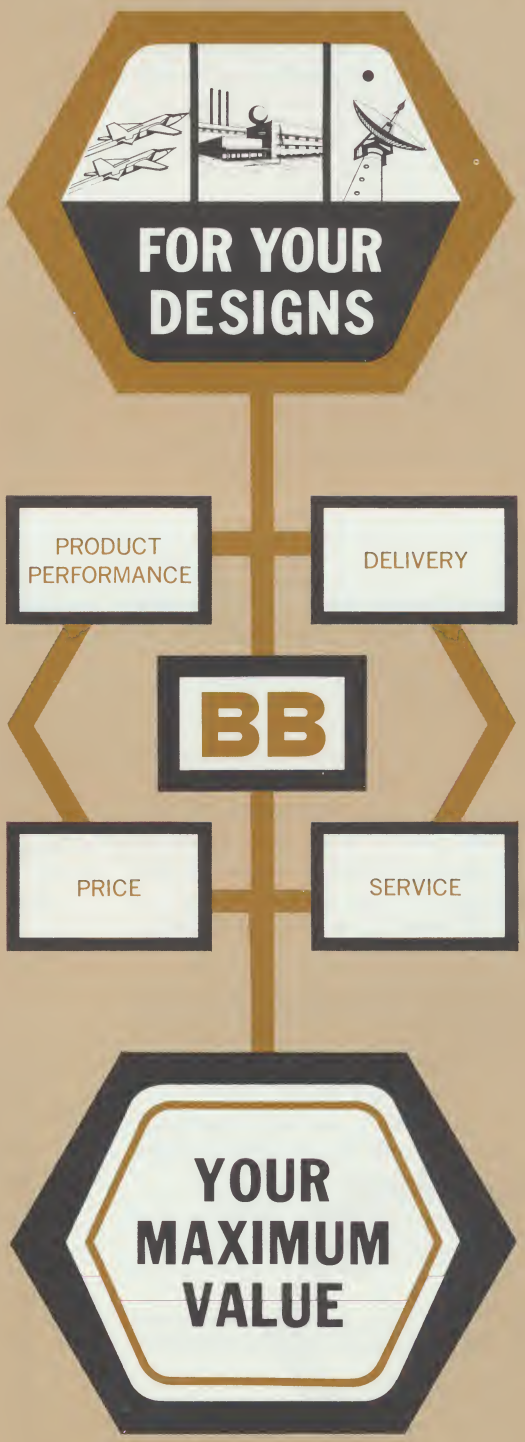
MARCH 1967 SHORT FORM CATALOG

BURR-BROWN

OPERATIONAL AMPLIFIERS AND FUNCTION MODULES



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BB RACK MOUNTING FUNCTION MODULES

Description	Note	Model	Basic Module Type (See P. 11)	Function Accuracy % f.s.	Response 1% kHz	Rated Input Volts	Rated Input k Ohms	Rated Output Volts	Rated Output mA	Power Supply ±15V @ mA Quies.	Unit Price U.S. $
QUARTER SQUARE MULTIPLIERS											
General Purpose, $E_o = -E_1E_2/10$	1	**1661**	/16	±1.6	1	±10	25	±10	±10	60	595
Fast, $E_o = E_1E_2/10$	1	**1671**	/16	±0.25	10	±10	2	±10	±20	55	795
DIODE FUNCTION GENERATOR											
Arbitrary Function, $E_o = f(E_1)$	3	**1662**	/16-2	—	10	±10	10	±10	±10	30	625
THREE MODE INTEGRATOR											
Reset, Integrate, Hold	2	**4003**	/16	±0.25	—	±10	0.1 MΩ 1.0 MΩ	±10	±10	40	365
SAMPLE AND HOLD											
µsec Acquisition	5	**1673**	/16	±0.1	500	±10	1	±10	±20	35	425
Fast Sample/Hold	4,5	**1663**	/16	±0.1	40	±10	2	±10	±20	35	355
Sample/Long Hold	4,5	**1666**	/16	±0.1	3	±10	10	±10	±20	20	295
ADAPTIVE ANALOG COMPARATOR											
Accuracy with Noise Immunity	8	**4002**	/16	±5mV	200ns	±10	2	+5, -5	±20	20	245
ABSOLUTE VALUE CIRCUIT $E_o = +\|E_1\|$	6	**4004**	/16	±0.25	10	±10	5	±10	±10	15	165
PRECISION RECTIFIER, $E_o = \text{Avg.}\{\frac{10}{3}\|E_1\|\}$	7	**1668**	/16	±1.0	.01-100	3V, rms	5	0 to +10	10	10	295
AC PREAMPLIFIER, Single-ended	7	**1669**	/16	±1.0	.03-10	.001 to 1V, rms	1 MΩ	3V, rms	3	15	245
LOGARITHMIC AMPLIFIERS					±1 dB to						
40 dB Log	9	**1664**	/16	±1.0	10	+0.1 to +10	10	±10	±20	15	295
60 dB Log	9	**1674**	/16	±1.0	5	+0.01 to +10	10	±10	±20	15	295
40 dB Log Ratio	9	**1665**	/16	±1.0	5	+0.01 to +10	10	±10	±20	15	365
40 dB Antilog	9	**1667**	/16	±1.0(9)	10	±10	100	+0.1 to +10	±20	15	295

Typical performance at 25°C and ±15 Volt Supply. Operating Temperature is -25°C to +85°C; Specification Range is 0°C to +60°C.

FOOTNOTES:

1. QUARTER SQUARE MULTIPLIERS / DIVIDERS

Both the Model 1661/16 and 1671/16 are four-quadrant multipliers; their useful bandwidth is generally limited to the 1% frequency response shown. For comparison, the -3dB response of the Models 1661/16 and 1671/16 are 50 kHz and 1 MHz, respectively.

Model 1661/16 features a two position switch for selecting the multiply mode shown or a two quadrant ($E_2 > 0$) divide mode ($E_o = -10\,E_1/E_2$). As with any analog divider, accuracy is inversely proportional to the magnitude of E_2.

Model 1671/16 features a six position switch for selecting one of the following functions: $-E_1E_2/10$, $E_1E_2/10$, $10\,E_1/E_2$ for $E_2 > 0$, $10\,E_1/E_2$ for $E_2 < 0$, $E_1^2/10$ sign E_1, $\sqrt{10\,|E_1|}$ sign E_1.

2. THREE MODE INTEGRATOR

The Model 4003/16 features electronic switching on external digital command into one of three operating modes:

	RESET	INTEGRATE	HOLD
Control Signal A	0V	+5V	+5V
Control Signal B	0V	0V	+5V

Other logic levels are available on special order. Two different integrator inputs are available for summing or time scaling flexibility in the INTEGRATE mode:

$$E_o = -(E_1)_{t=o} - \int_o^t (E_2 + 10\,E_3)\,dt$$

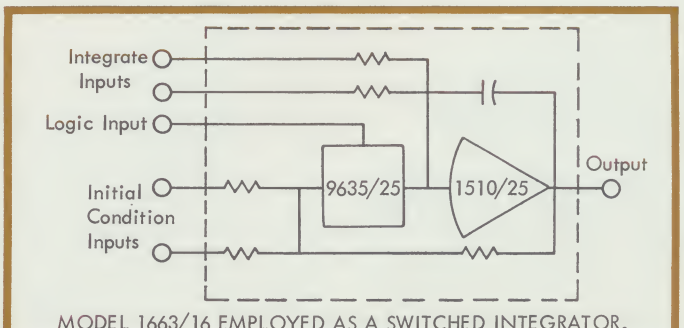
In the RESET mode the unit acquires an external initial condition voltage (E_1) in the ± 10 V range within one millisecond.

3. DIODE FUNCTION GENERATOR

Model 1662/16-2 provides an arbitrary, continuous voltage transfer function with eleven straight-line segments. Each segment slope is adjustable ± 2 V/V. Breakpoints are equally spaced, but the relative breakpoint spacing is adjustable from 2 volts to 1 volt. Input and output offset ranges of ± 10 volts allow concentration of breakpoints in any desired quadrant.

4. SWITCHED INTEGRATORS

The Models 1663/16 and 1666/16 may also be used as switched integrators, i.e., units which integrate for a specified compute interval and reset to initial conditions (IC) on command, as in high-speed repetitive/iterative analog computation. Both units have two initial condition inputs and two normal integrator inputs. The integrator inputs on the Model 1663/16 have gains of 10^3 and 10^4; the Model 1666/16 integrator gains are 10 and 100. Other gains are available on special order.

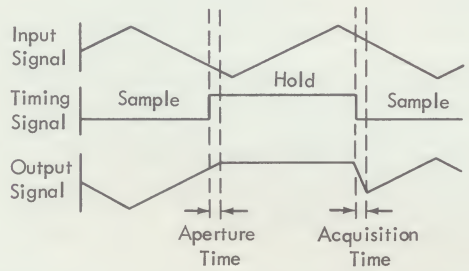


MODEL 1663/16 EMPLOYED AS A SWITCHED INTEGRATOR.

FOOTNOTES (continued)

5. SAMPLE AND HOLD MODULES

Sample and Hold (or Track and Store) modules follow a time-varying analog input signal and hold or store the value of the signal at a precisely controlled point in time. Units listed all have two track inputs both with -1 gains. Aperture time specifies the time between a HOLD command and completion of the transition to hold. Acquisition time specifies the time required to acquire an input for the worst-case condition of a 20 volt transition. Acquisition time determines maximum sampling rate; aperture time determines the accuracy in tracking fast signals.

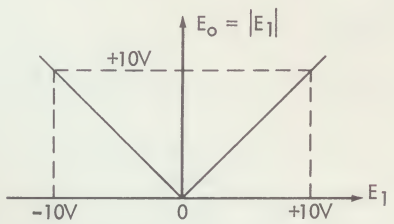


Model	Aperture Time n sec	Acquisition Time µsec	Output Drift in HOLD per 100 ms mV	Output Drift in HOLD per 100 ms drift mV/°C	Track/Hold Logic Levels* V
1673/16	50	1	±10	±0.2	-6/0
1663/16	50	10	Adj. to 10	± 10	-6/0
1666/16	200	100	± 1	±0.2	0/+5

* Other logic levels available on special order.

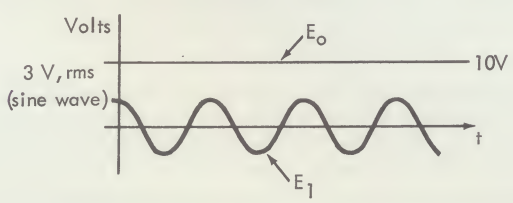
6. ABSOLUTE VALUE CIRCUIT

The Model 4004/16 provides a precision absolute value (full-wave rectifier) function over a ±10 volt range.



7. PRECISION RECTIFIER

The Model 1668/16 combines an absolute value circuit with an averaging filter, for determining the average (DC) value of rectified time-varying signals. The unit will accept signals at levels up to 3 V, rms and will effectively smooth out ripple for signals in the 10 Hz to 100 kHz spectral range. Model 1669/16 provides preamplification as required.

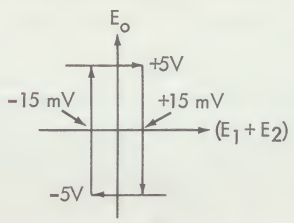


8. ADAPTIVE ANALOG COMPARATOR

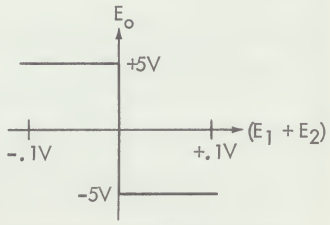
The Model 4002/16 provides a binary output signal of +5 Vdc or -5 Vdc, i.e. :

$$E_o = -5\,V \text{ for } (E_1 + E_2) > 0; \quad E_o = +5\,V \text{ for } (E_1 + E_2) < 0$$

For slowly varying signals, the comparator will switch within ±1 mV; for high-speed signals, the transition is initiated within ±5 mV of the true zero-crossing point. Switching speed of the output transition is 200 n sec, virtually independent of the input signal rate-of-change; note that a square wave input is not required to achieve this speed. For noise immunity the comparator adapts itself by introducing a ±15 mV hysteresis as the output changes state. For accurate comparison, this hysteresis is removed whenever the input sum exceeds ±100 mV. Operating temperature is 0°C to +60°C.



Comparator characteristic for $|(E_1 + E_2)| < 0.1V$ after a change of output state.



Comparator characteristic following $|(E_1 + E_2)| > 0.1V$ until next output change of state.

9. LOG AMPLIFIERS

Models 1664/16 and 1674/16 are linear-to-log converters covering 40 dB and 60 dB input ranges, respectively.

Model	Output Function
1664/16	$E_o = -10 \log_{10} E_1$; $0.1 \le E_1 \le 10\,V$
1674/16	$E_o = -\frac{20}{3} \log_{10} (\sqrt{10}\, E_1)$; $0.01 \le E_1 \le 10\,V$

Model 1665/16 provides an output proportional to the log of the ratio of two signals. Both inputs may vary over a 60 dB range provided the ratio does not exceed ±20 dB (40 dB range).

Transfer characteristic: $E_o = -10 \log_{10} (E_1/E_2)$; $0.1 < (E_1/E_2) < 10$

The Model 1667/16 is a log-to-linear converter which provides a 40 dB output range for ±10 volt input signals. It may be used with the Model 1664/16 and a potentiometer or amplifier to generate arbitrary exponents. Function accuracy is ±1 % of true value.

Output drift is less than ±10mV/°C from 0°C to +60°C for all units.

RACK MOUNTING FUNCTION MODULES

These pre-engineered circuits will save you time, money, and problems. Just plug them in, wire them together, and put them to use immediately.

BURR-BROWN

BB ENCAPSULATED FUNCTION MODULES

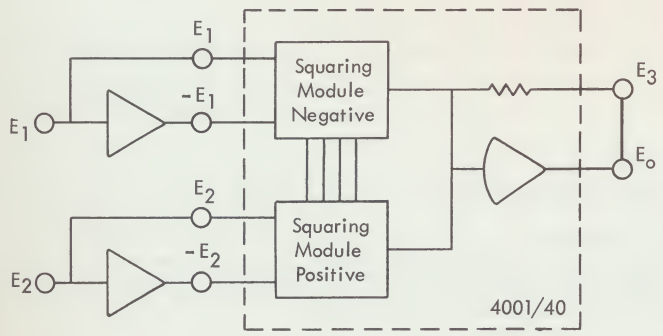
Typical performance at 25°C and ±15 Volt Supply. Operating Temperature is -25°C to +85°C; Specification Range is 0°C to +60°C.

Description	Note	Model	Basic Module Type	Function Accuracy % f.s.	Response 1% kHz	Rated Input Volts	Rated Input kΩ	Rated Output Volts	Rated Output mA	Power Supply ±15V @ mA Quies.	Unit Price U.S. $
QUARTER SQUARE MULTIPLIER											
Fast, $E_o = -E_1E_2/10$	1	**4001**	/40	0.25	50	±10	5	± 10	±20	45	675
SQUARING MODULES											
General Purpose, Positive	3	**9648**	/19	0.25	2	0 to +10	5	—	+0.4	17	145
General Purpose, Negative	3	**9671**	/19	0.25	2	-10 to 0	5	—	-0.4	17	145
Fast, Negative	3	**9874**	/19	0.1	100	-10 to 0	5	—	± 1	3	195
Fast, Positive	3	**9875**	/19	0.1	100	0 to +10	5	—	± 1	3	195
NOISE GENERATOR											
Random Digital Output	4	**4006**	/25	0.1dB	Clock to 1 MHz	0 to +1	1	+5, -5	±20	70	295
LOGARITHMIC AMPLIFIERS					±1 dB tc						
40 dB Log	5	**4007**	/40	2.0	5	+0.1 to +10	10	± 10	±10	15	275
60 dB Log	5	**4008**	/40	2.0	2.5	+0.01 to +10	10	± 10	±10	15	275
ADAPTIVE ANALOG COMPARATOR											
Switched Hysteresis	2	**9892**	/25	±5 mV	—	±10	2	+5, -5	±20	5	125
ELECTRONIC SWITCH MODULES				Current Gain	Turn On n sec	Turn Off n sec	On State Offsets mV	On State Offsets µA		Off State Offset	
Fast Sample/Hold	6	**9635**	/25	1000	300	50	± 1	± 5	±25	±0.1 nA	125
Sample/Hold	6	**9580**	/15	1000	400	200	±10	±0.1	±20	±0.1 nA	95
Integrate/Hold	6	**9859**	/15	1	3000	5000	negligible		± 1	±0.1 nA	75
Reset/Integrate/Hold	6	**9890**	/25	Combination of 9580 and 9859 with interconnecting logic.							150

FOOTNOTES:

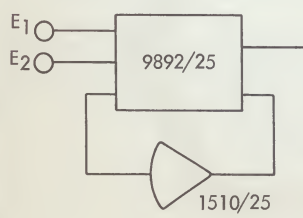
1. QUARTER SQUARE MULTIPLIER/DIVIDER

The Model 4001/40 combines two squaring circuits and a summing amplifier in a single encapsulated module. Note that two external inverters are required if inverted inputs are not elsewhere available in the system. Connections are as shown for $E_1E_2/10$; alternative connections provide $+E_1^2/10$, $-E_1^2/10$, or $-10\,E_3/E_2$.



2. ADAPTIVE ANALOG COMPARATOR

The Model 9892/25 must be used in combination with a high-speed operational amplifier. Specifications shown obtained with a Model 1510/25 amplifier. The resulting combination has characteristics comparable to the Model 4002/16 (Page 3). Operating temperature is 0°C to +60°C.



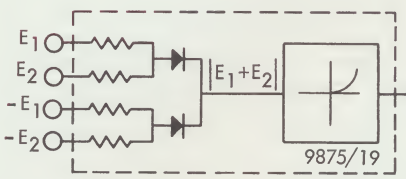
$E_o = +5$ for $(E_1 + E_2) > 0$

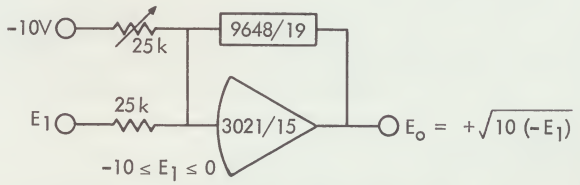
$E_o = -5$ for $(E_1 + E_2) < 0$

3. SQUARING MODULES

These modules are employed as submodules in the multipliers listed on Page 2. A single squaring module may be used in conjunction with an operational amplifier to obtain such functions as $\pm E_1^2/10$ and $\pm\sqrt{10\,E_1}$.

MODEL	OUTPUT CURRENT, mA
9874/19	$I_o = -\frac{1}{100}\left(\frac{E_1 - E_2}{2}\right)^2$
9875/19	$I_o = \frac{1}{100}\left(\frac{E_1 + E_2}{2}\right)^2$
9648/19	$I_o = \frac{1}{25}\left(\frac{E_1^2}{10} + 10\right)$
9671/19	$I_o = -\frac{1}{25}\left(\frac{E_2^2}{10} + 10\right)$



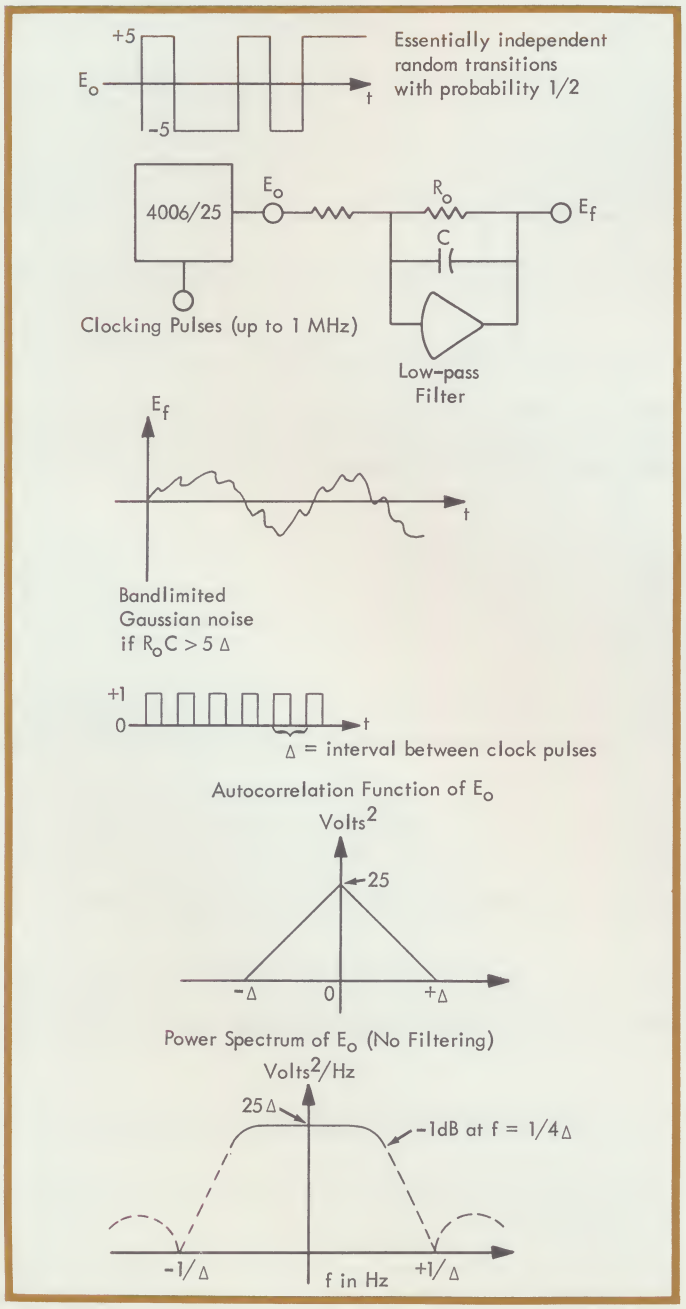


Note that the Models 9648/19 and 9671/19 accommodate inputs of only one polarity; the Models 9874/19 and 9875/19 will accommodate positive or negative inputs, and may be used to generate the square of positive or negative signals by connecting the signal to the E_1 and E_2 inputs and the inverted signal to the $-E_1$ and $-E_2$ inputs.

FOOTNOTES (continued)

4. NOISE GENERATOR

The Model 4006/25 Noise Generator is useful as a general purpose source of random test signals with precise spectral characteristics. Its output is a ±5 volt clocked random ("coin-toss") square wave; the clocking rate (user-determined) establishes the upper limit of the noise spectrum. With a 1 MHz clocking rate, the spectrum is flat from DC to 80 kHz within 0.1 dB, and to 250 kHz within 1 dB. Slower clocking rates yield a correspondingly narrower spectral range. Low-pass and band-pass output filters may be added to obtain a gaussian-distributed noise source with precisely controlled rms level and spectral shape. The clocking signal must be a periodic waveform that makes a negative-going transition from +1V to 0V in less than 10 µsec.



5. LOG AMPLIERS

Models 4007/40 and 4008/40 are linear-to-log converters covering 40 dB and 60 dB input ranges, respectively. A response of ±1 dB is provided to 5 kHz. Both modules have an output drift of less than ±5 mV/°C from 0°C to +60°C.

MODEL	OUTPUT FUNCTION
4007/40	$E_o = -10 \log_{10} E_1$
4008/40	$E_o = -(20/3) \log_{10} (\sqrt{10}\, E_1)$

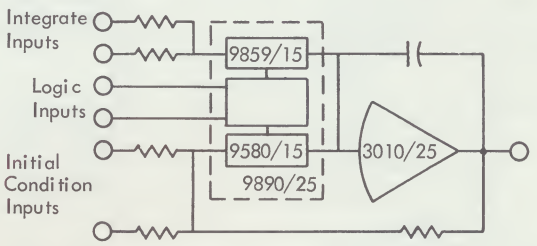
6. ELECTRONIC SWITCH MODULES

The Models 9635/25 and 9580/15 are switched current amplifiers (active switch/followers) employed in the Models 1663/16 and 1666/16. They are intended for use in very fast sample-hold and two-mode switched integrator circuits. See Footnotes 4 and 5, Pages 2 and 3.

The Model 9859/15 is a general-purpose electronic switch designed for a variety of applications, including integrator mode control circuits, switched amplifiers, and multiplexers. It has unity current gain and negligible DC offsets.

The Model 9890/25 is a combination of the 9580/15 and 9859/15 together with interconnecting logic to provide RESET/INTEGRATE/HOLD capability.

All of the switch modules shown are designed to deliver their output to an operational amplifier summing junction.



Logic levels for the 9635/25 and 9580/15 are -6V and 0V for TRACK and 0V and +5V for HOLD. For the 9859/15, the logic levels are +5V for INTEGRATE and 0V for HOLD. A truth table for the 9890/25 is presented in Footnote 2, Page 2. Other logic levels are available for all units on special order.

Drift in HOLD for all units is determined by the off state output offset current of the switch together with the input offset current of the amplifier. For this reason, chopper stabilized or FET input operational amplifiers are recommended for use with these units. Contact Burr-Brown for specific recommendations.

ENCAPSULATED FUNCTION MODULES

These unique time savers are designed to mount and work side by side with encapsulated operational amplifiers in your circuits.

BURR-BROWN

DC OPERATIONAL AMPLIFIERS FOR MOST APPLICATIONS

Description	MODEL NO.		RATED OUTPUT		DC GAIN	BANDWIDTH		SLEW RATE	INPUT VOLTAGE (1)			INPUT BIAS CURRENT (2)		
	Primary model number	Basic module type	min Volts	min mA	Open Loop typ dB	Unity Gain typ MHz	Full Power min kHz	min V/μs	offset 25°C typ mV	Average drift -25°C to +85°C typ μV/°C	Average drift -25°C to +85°C max μV/°C	offset 25°C typ nA	drift -25°C to +85°C typ nA/°C	drift -25°C to +85°C max nA/°C
GENERAL PURPOSE														
*HIGH PERFORMANCE, 3μV/°C														
Non-chopper, Differential	**3003**	/15	±10	± 20	110	2.0	20	1.2	±0.2	± 1	± 3	± 5	±0.1	±0.3
LOW DRIFT APPLICATIONS, 5μV/°C														
Preferred	**3004**	/15	±10	± 20	106	2.0	20	1.2	±0.3	± 2	± 5	± 5	±0.1	±0.3
General Usage	**3020**	/15	±10	± 10	100	2.0	20	1.2	±0.5	± 2	± 5	± 5	±0.2	±0.5
Commercial Grade	**3007**	/15C	±10	± 5	100	2.0	20	1.2	± 1	± 2	± 5	± 10	±0.5	±1.0
ROUTINE APPLICATIONS, 10μV/°C														
Preferred	**3005**	/15	±10	± 20	100	1.5	20	1.2	±0.5	± 5	± 10	± 5	±0.2	±0.5
General Usage	**3021**	/15	±10	± 10	96	1.5	15	0.9	±1.0	± 5	± 10	± 10	±0.4	±0.8
Commercial Grade	**3008**	/15C	±10	± 5	96	1.5	15	0.9	±2.0	± 5	± 10	± 15	±0.8	±1.2
NON-CRITICAL APPLICATIONS, 20μV/°C														
Preferred	**3006**	/15	±10	± 20	96	1.0	15	0.9	±1.0	± 10	± 20	± 10	±0.5	±1.0
General Usage	**3022**	/15	±10	± 10	90	1.0	10	0.6	±2.0	± 10	± 20	± 15	±0.8	±1.2
Commercial Grade	**3009**	/15C	±10	± 5	90	1.0	10	0.6	±3.0	± 10	± 20	± 20	±1.0	±1.5
HIGH OUTPUT CURRENT, ±50 mA	**3015**	/15	±10	± 50	100	1.5	10	0.6	±0.5	± 10	± 25	± 10	±0.5	±1.0
LOW NOISE, 1 μV, rms (max.) dc-1kHz (4)	**3019**	/15	±10	± 20	100	1.5	20	1.2	±0.5	± 5	± 10	± 5	±0.2	±0.5
HIGH INPUT IMPEDANCE, FET														
*Low Drift	**1556**	/15	±10	± 20	106	2.0	100	6	±0.5	± 2	± 5	±0.05	Doubles/+10°C	
General Usage	**1552**	/15	±10	± 20	106	2.0	100	6	±0.5	± 5	± 15	±0.05	Doubles/+10°C	
Commercial Grade	**1557**	/15	±10	± 10	100	1.0	50	3	±1.0	± 10	± 25	±0.1	Doubles/+10°C	
Wide Operating Temperature	**1554**	/15	±10	± 20	106	1.5	90	5.5	±0.5	See Note 8		±0.05	Doubles/+10°C	
CHOPPER STABILIZED (Solid State Chopper)														
*Lowest Drift	**3010**	/25	±10	± 20	160	15	1000	60	±0.01	±0.2	±0.5	±0.02	±0.0005	±0.001
General Usage	**3011**	/25	±10	± 20	160	15	800	50	±0.02	±0.5	±1.0	±0.03	±0.001	±0.002
Commercial Grade	**3012**	/25	±10	± 20	150	10	500	30	±0.05	±1.0	±2.0	±0.05	±0.002	±0.005
WIDEBAND														
DIFFERENTIAL														
* Fast Settling Time, < 1.5 μ sec (5)	**3013**	/15	±10	± 20	92	10	500	30	±0.5	± 10	± 15	±0.05	Doubles/+10°C	
High Output Current, 100 mA	**1527**	/25	±10	±100	100	15	1000	60	±0.5	± 10	± 15	± 5	±0.2	±0.5
General Usage, 20 mA	**1525**	/25	±10	± 20	106	15	500	30	±0.5	± 10	± 15	± 5	±0.2	±0.5
High Input Impedance, 100 mA	**1555**	/25	±10	±100	95	15	1000	60	±0.5	± 10	± 25	±0.1		
INVERTING														
* General Usage	**1510**	/25	±10	± 30	90	30	1000	60	±0.3	± 10	± 25	± 10	±0.5	±1.0
Low Bias Current	**1560**	/25	±10	± 30	90	60	2000	120	±0.5	± 10	± 25	±0.1	Doubles/+10°C	
Commercial Grade	**3014**	/15	±10	± 20	100	10	500	30	±0.5	± 10	± 20	± 10	±0.5	±1.0
MICROMINIATURE (6)														
General Usage	**1706**	/17	±10	± 10	100	1	10	0.6	±0.5	± 5	± 15	± 10	±0.5	±1.0
*High Input Impedance	**1752**	/17	±10	± 10	90	1	50	3	±1.0	± 15	± 30	±0.05	Doubles/+10°C	
Chopper Stabilized	**2901 A**	/29	±10	± 10	150	3	30	1.8	±0.5	± 1	± 2	±0.1	±0.002	±0.004
Wideband, Inverting	**1701**	/17	±10	± 10	92	3	30	1.8	±0.5	± 5	± 15	± 20	± 5	± 15
Power Booster	**1719**	/17	±10	± 50	0	May be used with any ± 10 Volt operational amplifier.								
MILITARY ENVIRONMENT (7)														
MIL-STD-202C and -810, 20 mA	**1901**	/19	±10	± 20	106	1.5	20	1.2	±0.3	± 5	± 10	± 5	±0.2	±0.5
MIL-STD-202C and -810, 2 mA	**1902**	/19	±10	± 2	96	1.5	20	1.2	±0.3	± 5	± 10	± 5	±0.2	±0.5
MIL-E-5272C	**1903**	/19	±10	± 2	96	1.5	10	0.6	±0.3	See Note 8		± 10	See Note 8	

Performance at 25°C (except as noted) and with ±15 V Power Supply.

FOOTNOTES:

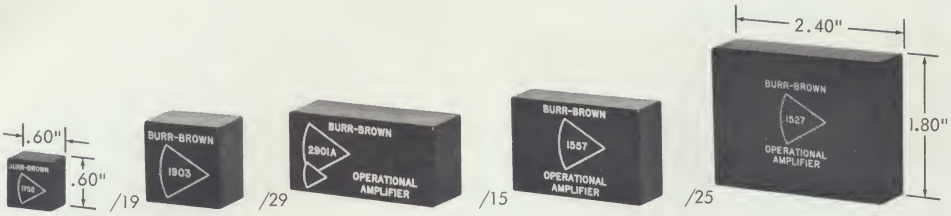
1) All Burr-Brown operational amplifiers operate with low offset voltages without the use of balancing potentiometers; however, each amplifier has provision for externally balancing the offset to zero.

2) Bias Current is the error current that may appear at either input of the amplifier. The difference between the magnitudes of these two input bias currents (differential offset current) is typically 2-5 times less than the bias at either input.

3) All 10V amplifiers operate with ±12Vdc to ±18Vdc power supply.

4) Complete noise specifications for Model 3019/15 are available upon request.

5) Settling time is the time required, after the unit has slewed to the final value, until it has settled back to within ±1% of the final value.



INPUT NOISE	INPUT R OPEN LOOP		INPUT LIMIT	OUTPUT R	OPERATING TEMP.		POWER SUPPLY		UNIT PRICE	SHIELDED ENCLOSURES	MODEL
dc to 10 kHz	Diff	CM	CM	Open Loop			Rated	Quies.	See Price List	Alternate Module Types	
typ μV, rms	typ MΩ	typ MΩ	max Volts	typ kΩ	min °C	max °C	typ Volts	max mA	U.S. $		
3	0.5	50	±10	5	- 40	+ 85	±15	5	95	/13,/16,/26	**3003** /15
3	0.5	50	±10	5	- 40	+ 85	±15	5	75	/13,/16,/26	**3004** /15
3	0.5	50	±10	5	- 40	+ 85	±15	5	60	/13,/16,/26	**3020** /15
3	0.5	50	±10	5	- 40	+ 85	±15	5	45	/13,/16./26	**3007** /15C
4	0.5	50	±10	5	- 40	+ 85	±15	5	60	/13,/16,/26	**3005** /15
4	0.5	50	±10	5	- 40	+ 85	±15	5	45	/13,/16,/26	**3021** /15
4	0.5	50	±10	5	- 40	+ 85	±15	5	35	/13,/16,/26	**3008** /15C
5	0.5	50	±10	5	- 40	+ 85	±15	5	45	/13,/16,/26	**3006** /15
5	0.5	50	±10	5	- 40	+ 85	±15	5	35	/13,/16,/26	**3022** /15
5	0.5	50	±10	5	- 40	+ 85	±15	5	25	/13,/16,/26	**3009** /15C
5	0.5	50	±10	3	- 40	+ 85	±15	6	65	/13,/16,/26	**3015** /15
Note 4	0.5	50	±10	5	- 40	+ 85	±15	5	80	/13,/16,/26	**3019** /15
6	$10^{11}\Omega$	$10^{11}\Omega$	±10	0.5	- 40	+ 85	±15	8	125	/13,/16,/26	**1556** /15
6	$10^{11}\Omega$	$10^{11}\Omega$	±10	0.5	- 40	+ 85	±15	8	95	/13,/16,/26	**1552** /15
10	$10^{10}\Omega$	$10^{10}\Omega$	±10	5	- 40	+ 85	±15	8	65	/13,/16,/26	**1557** /15
6	$10^{11}\Omega$	$10^{11}\Omega$	±10	0.5	- 55	+125	±15	8	145	/13,/16,/26	**1554** /15
6	0.5	SINGLE-ENDED INPUT		5	- 40	+ 85	±15	10	175	/13,/16,/26	**3010** /25
6	0.5	SINGLE-ENDED INPUT		5	- 40	+ 85	±15	10	145	/13,/16,/26	**3011** /25
10	0.5	SINGLE-ENDED INPUT		5	- 40	+ 85	±15	10	125	/13,/16,/26	**3012** /25
10	$10^{11}\Omega$	$10^{11}\Omega$	±10	5	- 40	+ 85	±15	8	95	/13,/16,/26	**3013** /15
6	0.5	50	±10	0.01	- 40	+ 85	±15	15	135	/13,/16,/26	**1527** /25
6	0.5	50	±10	5	- 40	+ 85	±15	6	95	/13,/16,/26	**1525** /25
6	$10^{11}\Omega$	$10^{11}\Omega$	±10	0.01	- 40	+ 85	±15	12	175	/13,/16,/26	**1555** /25
6	0.5	SINGLE-ENDED INPUT		0.1	- 40	+ 85	±15	15	95	/13,/16,/26	**1510** /25
10	$10^{11}\Omega$	SINGLE-ENDED INPUT		0.1	- 40	+ 85	±15	20	125	/13,/16,/26	**1560** /25
5	0.5	SINGLE-ENDED INPUT		5	- 40	+ 85	±15	6	60	/13,/16,/26	**3014** /15
6	0.5	50	±10	5	- 40	+ 85	±15	5	95		**1706** /17
10	$10^{11}\Omega$	$10^{11}\Omega$	±10	5	- 40	+ 85	±15	6	125		**1752** /17
10	0.5	SINGLE-ENDED INPUT		0.2	- 40	+ 85	±15	13	235		**2901 A** /29
3	0.3	SINGLE-ENDED INPUT		0.2	- 40	+ 85	±15	6	95		**1701** /17
					- 40	+ 85	±15	5	65		**1719** /17
5	0.5	50	±10	5	- 40	+ 85	±15	5	95		**1901** /19
5	0.5	50	±10	1.5	- 40	+ 85	±15	15	85		**1902** /19
5	0.5	30	± 3	0.2	- 55	+125	±15	15	145		**1903** /19

6) Microminiature amplifiers (like all other operational amplifiers manufactured by Burr-Brown) have internal phase compensation, input overvoltage protection and output short-circuit protection.

7) Military Environment - Models 1901/19 and 1902/19 have been certified under MIL-STD-202C and MIL-STD-810 for humidity, shock, altitude, acceleration, thermal shock and vibration. The Model 1903/19 is designed to meet environmental requirements of MIL-E-5272C. Mean-time-to-failure and electrical stress analysis is available for all Burr-Brown amplifiers.

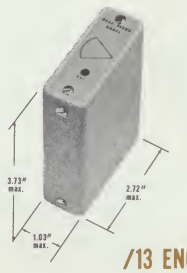
8) The average drift is 15μV/°C (max) from -55°C to +125°C for Models 1554/25 and 1903/19. Maximum input current drift is 0.8nA/°C from -55°C to +125°C for Model 1903/19.

JET STOCK

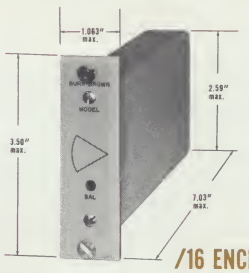
SAME DAY SHIPMENT from your local representative's JET STOCK of many of these operational amplifiers, connectors and accessories is provided for your prototype design needs. Contact your nearest U.S. representative.

SHIELDED ENCLOSURES

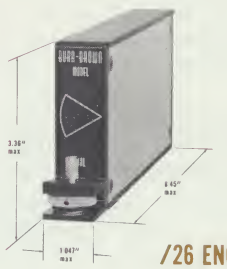
Any of the indicated amplifiers can be supplied in the /13, /16 or /26 shielded metal enclosures. In ordering add a /13, /16 or /26 to denote the desired enclosure, i.e., to order a Model 3003/15 in either a /13, /16 or /26 enclosure, specify 3003/13, 3003/16 or 3003/26. The unit is installed on a printed circuit board and is equipped with a voltage offset zeroing potentiometer (accessible from the front panel) and a mating connector. Prices are the basic price of the encapsulated amplifier plus $20 for a /13 enclosure and $30 for a /16 or /26 enclosure.



/13 ENCLOSURE



/16 ENCLOSURE



/26 ENCLOSURE

OPERATIONAL AMPLIFIERS FOR MOST APPLICATIONS

* Starred units are recommended for your shelf stock for quick breadboarding of design ideas.

BURR-BROWN

DC OPERATIONAL AMPLIFIERS FOR SPECIAL APPLICATIONS

Description	MODEL NO.		RATED OUTPUT		DC GAIN	BANDWIDTH		SLEW RATE	INPUT VOLTAGE			INPUT BIAS CURRENT		
	Primary Model Number	Basic Module Type	min Volts	min mA	Open Loop typ dB	Unity Gain typ MHz	Full Power min kHz	min V/µs	offset 25°C typ mV	Average drift -25°C to +85°C typ µV/°C	Average drift -25°C to +85°C max µV/°C	offset 25°C typ nA	drift -25°C to +85°C typ nA/°C	drift -25°C to +85°C max nA/°C
BATTERY POWERED – ±4 Volt Output														
General Purpose (1)	**3001**	/15	± 4	± 5	100	0.8	5	0.1	±0.3	± 5	± 10	± 5	±0.3	±0.5
High Impedance (1)	**3002**	/15	± 4	± 5	96	1.0	30	0.7	±0.5	± 10	± 15	±0.05	Doubles/+10°C	
HIGH VOLTAGE – ±20 Volt Output														
General Purpose	**1540**	/15	± 20	± 10	106	1.5	10	1.2	±0.3	± 5	± 10	± 10	±0.3	±0.5
High Input Impedance – FET	**1543**	/15	± 20	± 10	103	1.5	50	6	±0.5	± 5	± 15	±0.1	Doubles/+10°C	
Chopper Stabilized (Solid State)	**1548**	/25	± 20	± 10	160	15.0	100	12	±0.02	±0.5	±1.0	±0.03	±0.001	±0.002
Commercial Grade	**1547**	/15	± 20	± 5	100	1.0	10	1.2	±0.5	± 10	± 20	± 20	±0.5	±1.0
HIGH VOLTAGE – ±50 Volt Output														
General Purpose	**1541**	/25	± 50	± 10	110	0.4	3	0.9	±0.3	± 10	± 25	± 10	±0.5	±1.0
High Input Impedance – FET	**1544**	/25	± 50	± 20	110	1.0	20	6	±0.5	± 10	± 25	±0.1	Doubles/+10°C	
Chopper Stabilized (Solid State)	**1643 A**	/16	± 50	± 20	160	3.0	50	15	Adj.	±0.5	±1.0	±0.05	±0.01	±0.02
HIGH VOLTAGE – ±100 Volt Output														
General Purpose	**1542**	/25	±100	± 10	110	0.4	3	1.8	±0.5	± 10	± 25	± 10	±0.5	±1.0
High Input Impedance – FET	**1545**	/25	±100	± 10	110	1.0	20	12	±0.5	± 10	± 25	±0.1	Doubles/+10°C	
Chopper Stabilized (Solid State)	**1644 A**	/16	±100	± 10	160	3.0	50	30	Adj.	±0.5	±1.0	±0.05	±0.01	±0.02
DIFFERENTIAL OUTPUT – ±10 Volt (3)	**1514**	/25	± 10	± 20	106	0.7	10	0.6	±0.3	± 5	± 15	± 10	±0.3	±0.5
EXTERNAL PHASE COMPENSATION														
±10 Volt Output (2)	**1509**	/15	± 10	± 20	120	External Adj. (2)			±0.3	± 5	± 15	± 10	±0.3	±0.5
±10 Volt High Impedance – FET (2)	**3018**	/15	± 10	± 20	112	External Adj.			±0.5	± 10	± 15	±0.1	Doubles/+10°C	
±20 Volt Output (2)	**1549**	/15	± 20	± 10	120	External Adj.			±0.3	± 5	± 15	± 10	±0.3	±0.5
POWER BOOSTER														
±10 Volt, 100 mA	**1520**	/15	± 10	±100	0	—	300	18	May be used with any General Purpose Operational Amplifier with the same rated output voltage. Overall bandwidth is determined by the amplifier-booster combination.					
±10 Volt, 200 mA	**3016**	/25	± 10	±200	0	—	300	18						
±10 Volt, 500 mA	**1634 A**	/16	± 10	±500	0	—	50	3						
±20 Volt, 100 mA	**3017**	/25	± 20	±100	0	—	150	18						

Typical performance at 25°C (unless otherwise noted) and with rated power supply.

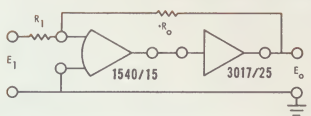
INSTRUMENTATION AMPLIFIERS

Description	Model	Package (See P. 11)	Gain	Rated Output		Response @ ±1%	Output Voltage Drift % of f.s.		Static Linearity	Output Noise	Output Z	Input Z	Input CM Limit	Operating Temp. Range		Quies. Drain @±15V Supply	Unit Price
			typ ratio	min V	min mA	typ kHz	typ %/°C	typ %/day	typ % f.s.	typ mV, rms	typ Ω	typ Ω	max V	min °C	max °C	typ mA	U.S. $
TRANSDUCER AMPLIFIERS (1)	**1505B**	/15	10–1000	±10	±20	10	±0.05	±0.2	±0.1	20	5	10^{11}	± 5	-40	+85	± 6	95
	1660B	/16	10–1000	±10	±20	10	±0.1	±0.3	±0.1	20	5	10^{11}	± 5	-40	+85	± 6	135
PREAMPLIFIERS (2) single-ended DC	**1632 A**	/16	1, 10, 100	±10	±10	10	±0.01	±0.05	±0.1	1	1	10^{7}	—	-25	+85	±10	155
differential DC	**1636**	/16	1, 10, 100	±10	±10	10	±0.01	±0.05	±0.1	1	1	10^{7}	±10	-25	+85	±15	225
GALVANOMETER AMPLIFIER (3)	**1631 A**	/16	1 to 11	±10	±80	25	±0.01	±0.05	±0.1	3	1 or 30	11K	—	-25	+85	±25	195

Typical performance at 25°C and with rated ±15 Volt power supply unless otherwise noted.

COMPLIMENTARY HANDBOOKS

Our two industry reference handbooks: Handbook of Operational Amplifier Active RC Networks (104 pages) and Handbook of Operational Amplifier Applications (96 pages) are available upon request.

INPUT NOISE	INPUT R OPEN LOOP		INPUT LIMIT	OUTPUT R	OPERATING TEMP.		POWER SUPPLY		UNIT PRICE	SHIELDED ENCLOSURES	MODEL
dc to 10 kHz	Diff	CM	CM	Open Loop			Rated	Quies.	See Price List	Alternate Module	
typ μV, rms	typ MΩ	typ MΩ	max Volts	typ kΩ	min °C	max °C	typ Volts	max mA	U.S. $	Type	
1*	1	50	± 4	5	- 40	+85	± 6	1	65	/13,/16,/26	**3001**/15
2.5* *dc-1kHz	$10^{11}\Omega$	$10^{11}\Omega$	± 4	5	- 40	+85	± 6	2	95	/13,/16,/26	**3002**/15
3	0.5	100	±15	5	- 40	+85	± 26	5	85	/13,/16,/26	**1540**/15
10	$10^{11}\Omega$	$10^{11}\Omega$	±15	5	- 40	+85	± 26	7	125	/13,/16,/26	**1543**/15
10	0.5	SINGLE-ENDED INPUT		5	- 40	+85	± 26	8	165	/13,/16,/26	**1548**/25
6	0.2	40	±15	5	- 40	+85	± 26	5	55	/13,/16,/26	**1547**/15
10	0.5	100	±20	5	- 40	+85	± 60	10	115	/13,/16,/26	**1541**/25
12	$10^{11}\Omega$	$10^{11}\Omega$	±20	20	- 40	+85	± 60	7	145	/13,/16,/26	**1544**/25
30	0.5	SINGLE-ENDED INPUT		0.5	- 40	+85	± 60	20	275	/26	**1643A**/16
10	0.5	100	±20	10	- 40	+85	±120	10	135	/13,/16,/26	**1542**/25
10	$10^{11}\Omega$	$10^{11}\Omega$	±20	30	- 40	+85	±120	7	165	/13,/16,/26	**1545**/25
30	0.5	SINGLE-ENDED INPUT		0.5	- 40	+85	±120	20	295	/26	**1644A**/16
6	0.5	50	±10	0.5	- 40	+85	± 15	10	125	/13,/16,/26	**1514**/25
6	0.5	50	±10	0.5	- 40	+85	± 15	7	75	/13,/16,/26	**1509**/15
10	$10^{11}\Omega$	$10^{11}\Omega$	±10	0.5	- 40	+85	± 15	5	110	/13,/16,/26	**3018**/15
6	0.5	100	±15	0.5	- 40	+85	± 26	7	95	/13,/16,/26	**1549**/15
					- 40	+85	± 15	10	45	/13,/16,/26	**1520**/25
					- 40	+85	± 15	15	65	/13,/16,/26	**3016**/15
					- 40	+85	± 15	35	95	/26	**1634A**/16
					- 40	+85	± 26	15	65	/13,/16,/26	**3017**/25

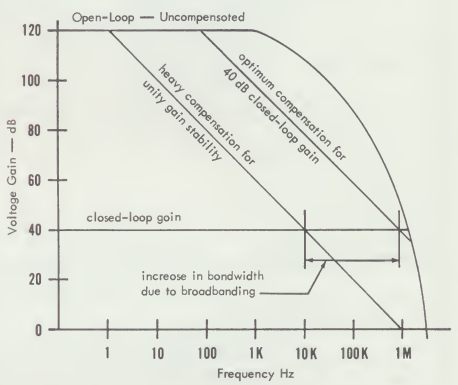
OPERATIONAL AMPLIFIER FOOTNOTES:

1. BATTERY POWERED AMPLIFIERS

Models 3001/15 and 3002/15 have complete noise specifications available upon request.

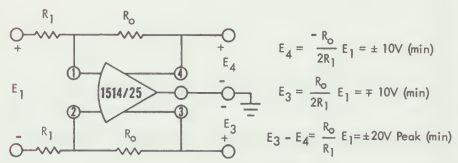
2. EXTERNAL PHASE COMPENSATION

Most amplifiers are heavily compensated internally for 6 to 9 dB per octave roll-off to maintain unconditional stability at all gains. As a result, the bandwidth is reduced at high gain settings. The Models 1509/15, 1549/15 and 3018/15 permit external adjustment of bandwidth by the simple selection of a resistor and a capacitor. In the example shown, the gain-bandwidth product is 100 MHz.



3. BALANCED DIFFERENTIAL OUTPUT

This unique amplifier provides two output voltages of opposite polarity. The voltages are held equal in magnitude by a "ground-sniffing" output circuit delivering ±10V at each output or 20V Peak across both.



INSTRUMENTATION AMPLIFIER FOOTNOTES:

1. TRANSDUCER AMPLIFIERS

These units are differential input amplifiers providing high input impedance and high common mode rejection, independent of gain. Fixed gain of the Model 1505B/15 is determined by an external feedback network. The Model 1660B/16 has a factory set gain which can be easily modified by the user. When ordering specify the desired gain setting. The units will operate with supply voltage from ±14V to ±16V. Response, drift and noise are specified at gain of 1000.

2. PREAMPLIFIERS

The Model 1632A/16 is a single-ended DC preamplifier with precise selectable gains of 1, 10, and 100. DC offset may be balanced by means of an internal zero control.

The Model 1636/16 is like the Model 1632A/16 but has a differential input with a CMRR of 80 dB. The units will operate with power supply voltage from ±12V to ±18V.

3. GALVANOMETER AMPLIFIER

The Model 1631A/16 is a universal DC power amplifier intended primarily for driving fluid damped optical galvanometers. Gain is continuously adjustable from 1-11 with a 10-turn potentiometer. Used with Models 1632A/16 or 1636/16 continuously adjustable gain of 1 to 1000 is provided.

OPERATIONAL AMPLIFIERS FOR SPECIAL APPLICATIONS

These units are special only in output voltage or power. Other special units are designed at a rate of one per day.

BURR-BROWN

BB ACTIVE FILTERS

ACTIVE FILTER MODULES

These low-pass active RC networks employ Burr-Brown's high performance DC operational amplifiers in unique combination with quality passive elements.

By employing the operational amplifier as the foundation of an active filter Burr-Brown can use its experience and knowledge in the amplifier field to optimize your filter designs. Burr-Brown offered the industry's first solid-state operational amplifier. Now, it is first to offer the combination of operational amplifiers and passive elements to fulfill your active filter requirements.

Whether you specify low-pass, high-pass, band-pass, or band rejection, Burr-Brown active filters provide:

- STABLE CUTOFF FREQUENCY
- LOW OUTPUT IMPEDANCE
- HIGH INPUT IMPEDANCE
- DC STABILITY
- SMALL, LIGHT-WEIGHT MODULES
- INVERTING OR NON-INVERTING GAIN

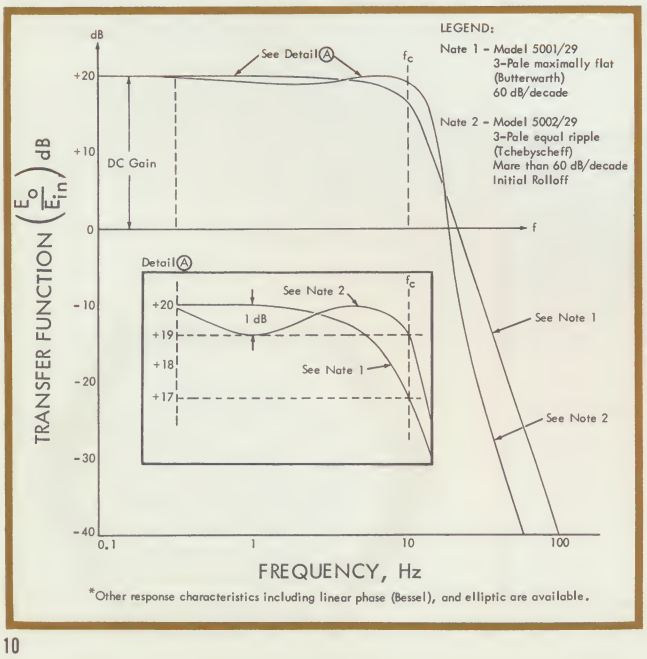
Model 5001/29

This low-pass active filter module provides maximally-flat (Butterworth) response with 60 dB per decade rolloff above the 3 dB frequency (f_c). Fixed bandpass gain and fixed cutoff frequency (f_c) may be specified within the wide ranges indicated. Because of the high input impedance (more than 10 kΩ), the low output impedance (less than 10Ω), and the inverting gain (-0.5 to -100 V/V), this unit can function both as a filter and an amplifier in your circuit designs.

Model 5002/29

This low-pass active filter module provides equal ripple (Tchebyscheff) response. The initial rolloff rate of this filter is increased as the specified maximum ripple is increased. Cutoff frequency (f_c) is defined as the point on the frequency response curve at which the response is down by the amount of the allowable ripple; that is, 1 dB down for a 1 dB maximum ripple filter.

TYPICAL FREQUENCY RESPONSE *



*Other response characteristics including linear phase (Bessel), and elliptic are available.

LOW PASS ACTIVE FILTERS

Description \ Models	5001/29	5002/29	Special Order
Type	Low Pass Inverting	Low Pass Inverting	LP, HP, BP, BR See below
No. of Poles	3	3	2 to 7
Characteristic	Max. Flat (Butterworth)	Equal Ripple (Tchebyscheff)	As Required (Describe)
Pass Band Gain	-6dB to +40dB	-6dB to +40dB	-20dB to +60dB
Cutoff Frequency	5 Hz to 20kHz	5 Hz to 20kHz	0.1 Hz to 100kHz
Frequency Stability	±0.05%/°C	±0.05%/°C	±0.01 to 1%/°C
Roll-off Rate	60dB/decade	60dB/decade	40 to 140dB/dec.
Maximum Ripple	±0.1dB	±0.5 to ±3dB	±0.1 to ±3dB
Input	Single Ended	Single Ended	Single Ended
Input Impedance	10kΩ min.	10kΩ min.	1kΩ to 10MΩ
Output Offset	Ext. Adj. to 0	Ext. Adj. to 0	Ext. Adj. to 0
Output Swing	±10 V	±10 V	±4V to ±100V
at Output Current	±10 mA	±10 mA	±1mA to ±50mA
Rated Power Supply	±15 V	±15 V	±6V to ±120V
Range	±12V to ±18V	±12V to ±18V	As Required
Quies. Current	±20 mA	±20 mA	As Required
Operating Temperature	-25°C to +85°C	-25°C to +85°C	Submit your requirements for a special quotation
Module Type	/29	/29	
Unit Price (U.S.)	$175.00	$195.00	

SPECIAL ORDER Active Filters

Active filters for low-pass, high-pass, band-pass, and band rejection applications are all available from Burr-Brown. During the past ten years, but particularly since we "wrote the book" on Operational Amplifier Active RC Networks, Burr-Brown has designed and produced a wide range of industrial and military active filters. The above chart lists ranges of performance typical of those currently feasible in active filters. Our applications staff is uniquely qualified to discuss your particular requirements.

ORDERING INFORMATION

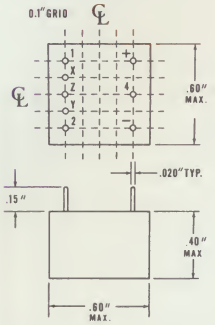
When ordering any Burr-Brown active filter, be sure to specify:

- REQUIREMENT
  (Low Pass, Band Pass, High Pass, Band Rejection)
- RESPONSE DESIRED
  (Butterworth, Tchebyscheff, etc)
- CUTOFF FREQUENCY (f_c)
- PASS BAND GAIN
- MAXIMUM RIPPLE
  (For Tchebyscheff Filters)

MECHANICAL SPECIFICATIONS

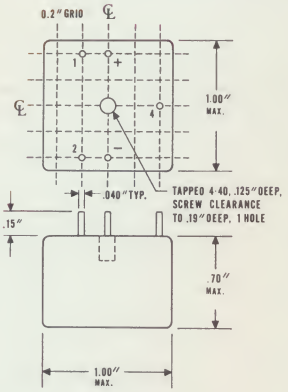
The /15, /17, /19, /25, /29 and /40 epoxy cast modules may be secured to a printed circuit board or chassis with 4-40 machine screws (or locking clip for the /17 module). The gold-flashed pins may be hand or dip soldered or plugged into an optional mating connector.

The /13, /16 and /26 plug-in units are furnished with internal controls and mating connectors. Up to 16 of the /16 or /26 modules may be mounted in a 3-1/2" x 19" rack adapter.



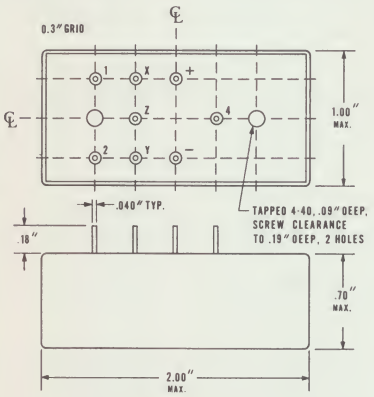
/17 MODULE

Connector - 1700MC
Weight - 0.2 oz typ.



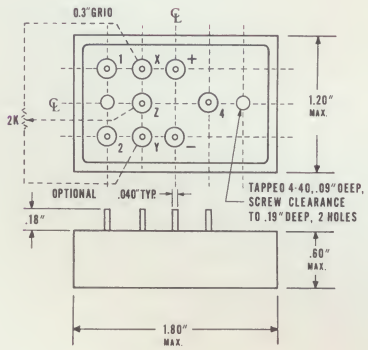
/19 MODULE

Connector - 1900MC
Weight - 0.8 oz typ.



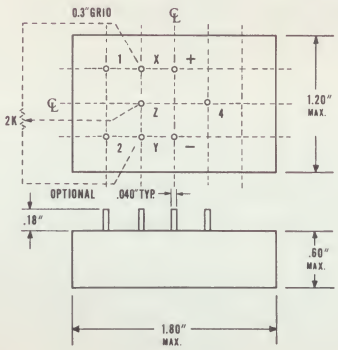
/29 MODULE

Connector - 1500MC
Weight - 1.5 oz typ.



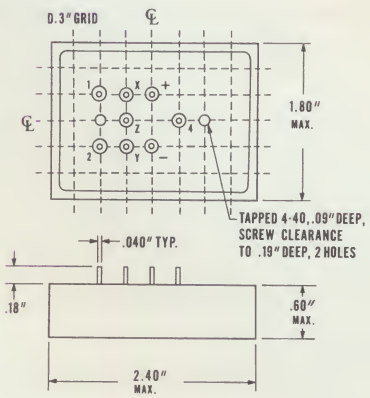
/15 MODULE

Connector - 1500MC
Weight - 1.3 oz typ.



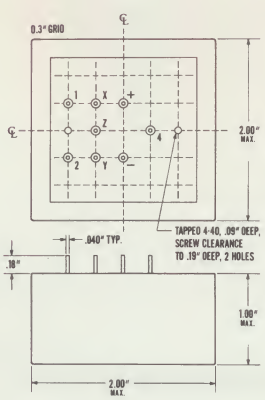
/15C MODULE

Connector - 1500MC
Weight - 1.3 oz typ.



/25 MODULE

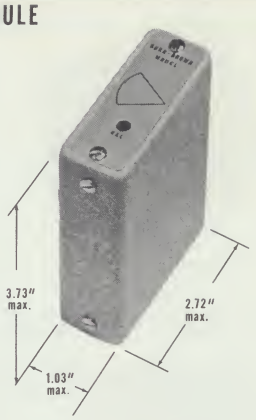
Connector - 1500MC
Weight - 2.6 oz typ.



/40 MODULE

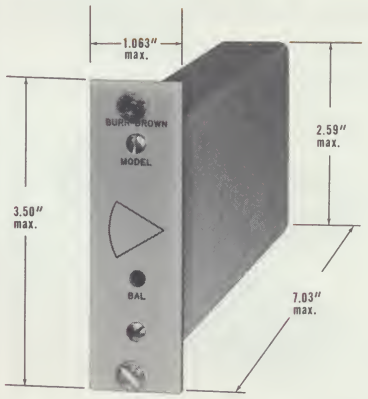
Connector - 1500MC
Weight - 4 oz typ.

/13 MODULE



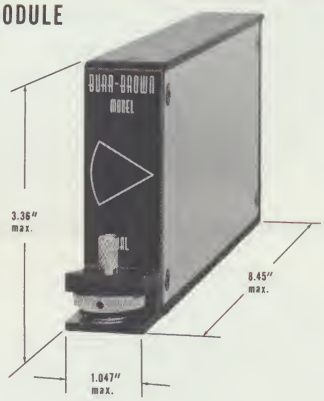
Mating Connector (Burndy EC4206P5) furnished with each unit.

/16 MODULE



Mating Connector (Burndy EC4206P5) furnished with each unit. The /16-2 module is identical to the /16 package except that it is twice the width.

/26 MODULE



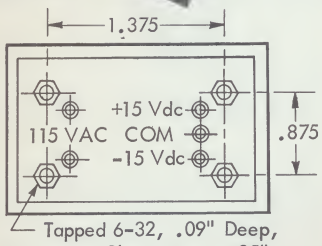
Mating Connector (Amphenol 143-012-01) furnished with each unit.

MECHANICAL DIMENSIONS

We also furnish encapsulated units mounted on customer specified printed circuit boards.

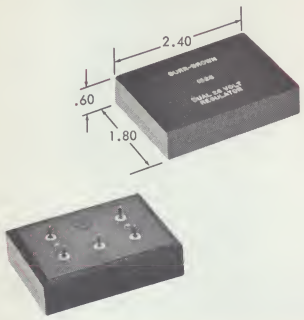
POWER SUPPLIES AND REGULATORS

MODEL 501



Tapped 6-32, .09" Deep, Screw Clearance to .25" Deep, 4 Holes.

MODELS 1515/25 AND 1526/25



MODEL 503A

MODEL 508/16

MODELS 2600-16R and 508/26

POWER SUPPLIES

Burr-Brown dual regulated power supplies provide ±0.1% regulation (no load to full load or 105 to 125 and 210 to 250 Vac line variation) to power operational amplifiers and other modules. Operating power is obtained from 47 to 420 Hz line. Epoxy cast supplies are offered in both 115 Vac and 230 Vac versions, while all other supplies listed below feature an integral switch to accommodate operation at either 115 Vac or 230 Vac.

DESCRIPTION	MODEL	RATED OUTPUT Vdc	RATED OUTPUT mA	OUTSIDE DIMENSIONS (max.)	UNIT PRICE U.S. $
Epoxy Cast Modules: Chassis mount with solder lugs.					
For 115 Vac line	***501***	± 15	± 120	3-1/2" x 3" x 2"	148
For 230 Vac line	***521***	± 15	± 120	3-1/2" x 3" x 2"	148
For 115 Vac line	***505***	± 26	± 60	3-1/2" x 3" x 2"	148
For 230 Vac line	***525***	± 26	± 60	3-1/2" x 3" x 2"	148
Plug-in Modules: Mount with modules in 2600-16R rack adapter.					
Four modules wide	***506/26***	± 15	±1000	3-3/8" x 4-1/4" x 9"	280
Four modules wide	***507/26***	± 26	± 600	3-3/8" x 4-1/4" x 9"	320
Six modules wide	***508/26***	± 60	± 500	3-3/8" x 6-3/8" x 9"	420
Six modules wide	***509/26***	±120	± 250	3-3/8" x 6-3/8" x 9"	420
Powered Rack Adapters: Houses /16 amplifier modules for 19" rack mounting.					
Mounts 12 modules	***506/16***	± 15	±1000	3-1/2" x 19" x 9-1/2"	340
Mounts 12 modules	***507/16***	± 26	± 600	3-1/2" x 19" x 9-1/2"	380
Mounts 10 modules	***508/16***	± 60	± 500	3-1/2" x 19" x 9-1/2"	480
Mounts 10 modules	***509/16***	±120	± 250	3-1/2" x 19" x 9-1/2"	480
Bench Supply: Provides five way binding posts for bench use.					
Fixed output voltages	***503A***	± 15	±1000	5" x 3" x 12"	280

DUAL REGULATORS

Dual regulator modules provide ±0.1% regulation (line and load) to power operational amplifiers and analog modules from a center tapped unregulated source. Output noise of 10 µV rms and stability of ± .02%/°C from -25°C to +85°C are features. Basic module type is /25. Connector is 1500MC-1.

MODEL	DC RATED OUTPUT Volts	DC RATED OUTPUT mA	DC INPUT VOLTAGE			UNIT PRICE
	nominal	min	min	nominal	max	U.S. $
1515/25	± 15	±100	± 20	± 26	± 32	95
1526/25	± 26	± 60	± 30	± 38	± 45	98

JET STOCK

Burr-Brown's new "Jet Stock" program provides immediate or overnight replenishment of your local representative's inventory of many of the popular operational amplifiers, connectors and accessories for your prototype design needs. Your order is shipped immediately from your local Representative's office. Call your nearest Representative today!

CONNECTORS AND ACCESSORIES

FOR /15, /15C, /25, /29 and /40 MODULES

MATING CONNECTOR (as shown) accommodates all these modules for plug-in installation or test. Model 1500MC : $3

MATING CONNECTOR is similar to the 1500MC for mounting dual regulators. Model 1500MC-1 : $3

FEEDBACK BOARD provides solder terminals for feedback components. Model 1500FB : $10

CIRCUIT SIMULATOR (as shown) is a patch panel with 3/4" spaced jacks for feedback elements. Includes offset control. Model 1500CS : $25

FOR /17 MODULES

MATING CONNECTOR (as shown) accommodates all /17 modules for plug-in installation. Model 1700MC : $3

ADAPTER PLUGS allow use of /17 units on 1500CS Circuit Simulator. Model 1700AP (for Model 1701) : $6. Model 1700AP-1 (for all other 1700 units) : $6

FOR /19 MODULES

MATING CONNECTOR (as shown) accommodates all /19 operational amplifiers. Model 1900MC : $3. For Model 9874 and 9875 squaring modules use the Model 1900MC-1 : $3

ADAPTER PLUG allows use of 1500CS Circuit Simulator. Model 1900AP : $6

FOR /16 MODULES

RACK ADAPTER holds 16 units in a 3-1/2" x 19" rack space. Model 1600-16R : $80

WIRED RACK ADAPTER is identical to the 1600-16R but includes mating connectors and power bus wire. Model 1600-16RW : $100

HALF RACK ADAPTER holds 7 units in a 3-1/2" x 9-1/2" rack space. Model 1600-7R : $50

POWERED RACK ADAPTER - See Power Supplies, 506/16, 507/16, 508/16, 509/16.

MATING CONNECTOR (Burndy EC4206P5) is furnished with unit. Extra connectors : $2

BLANK PANEL provides uniform appearance of the rack. Model 1600 BP : $2

CARD EXTENDER allows testing without disconnecting unit from rack. Model 1600CE : $30

BLANK MODULE is the same enclosure as the /16 module. Terminals for each pin are mounted next to the connector on the printed circuit board. Model 1600M : $25

FOR /16-2 MODULES

BLANK MODULE is similar to the /16 with the exception of double width. Model 1600M-2 : $35

MATING CONNECTOR same as /16 is furnished with unit. Extra connectors : $2

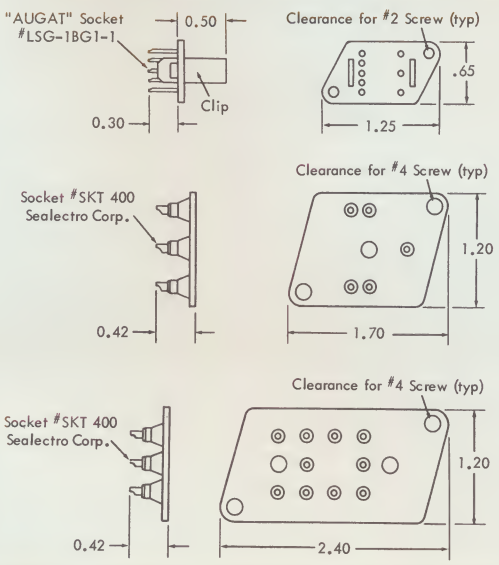
FOR /26 MODULES

RACK ADAPTER holds 16 units in 3-1/2" x 19" rack space. Model 2600-16R : $80

MATING CONNECTOR (Amphenol 143-012-01) is furnished with unit. Extra connectors : $2

BLANK MODULE is the same enclosure as the /26 module. Terminals for each pin are mounted next to the connector on the printed circuit board. Model 2600M : $25

CONNECTOR CONFIGURATIONS



1700MC

MATERIAL: .062 Thick Black Formica
GRADE: LE or Equivalent
SOCKET CONTACTS:
Beryllium Copper
Gold Flash Over Nickel

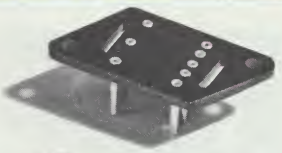
1900MC

MATERIAL: .062 Aluminum Alloy 6061
FINISH: Hard Black Anodize
SOCKET CONTACTS:
Beryllium Copper
Gold Flash Over Silver

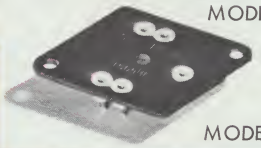
1500MC

MATERIAL: .062 Aluminum Alloy 6061
FINISH: Hard Black Anodize
SOCKET CONTACTS:
Beryllium Copper
Gold Flash Over Silver

MODEL 1700MC ASSEMBLED

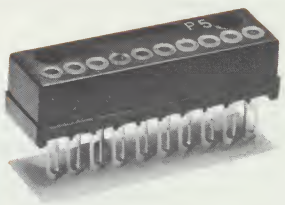


MODEL 1700MC



MODEL 1900MC

MODEL 1500MC



BURNDY EC4206P5

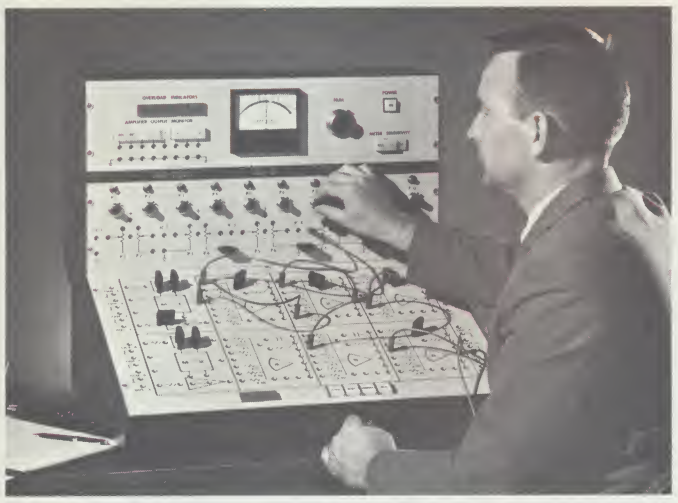
MODEL 1500CS

POWER SUPPLIES AND CONNECTORS

With one of these power supplies and the right connector, you can plug in your amplifier or function module the day it arrives.

BURR-BROWN

BB INSTRUMENTS AND COMPUTERS



EDUCATIONAL ANALOG SIMULATOR

The Model 600 Educational Analog Simulator is specifically designed for teaching. A proven aid for teaching computer familiarity, analog techniques, systems design and analysis, and mathematics, the simulator is equally at home in the university and industrial laboratory.

In the universities, the Model 600 Simulator is being used in classroom demonstrations as well as laboratory courses to enhance understanding of difficult theoretical concepts and student experience in analog computing techniques. The large fixed patch field and economical price promote efficiency in student grasp per hour per dollar. The ease of use and meaningful results provide real motivation for the students as evidenced by their initiative in pursuing additional problems and verifying their own theories. High school seniors with little or no knowledge of either calculus or electronics have successfully mastered the Model 600. University professors have slaved up to 6 or 8 simulators together to solve large and complex problems. The Model 600 is truly a versatile educational instrument.

In industry, the Model 600 can be used to train engineers and technicians in analog techniques, thus freeing larger, more complex computers for design and analysis. The Model 600 can be used to solve smaller design problems, to check portions of larger problems before going to a large computer, and, by slaving several Model 600 simulators, to handle entire programs. The desk top size of this instrument permits easy movement from office to laboratory to test stand where actual systems or system components can be included in the computer loop.

A wide range of meaningful linear and nonlinear problems can be solved with the complement of computing elements provided. Complete with 10 amplifiers, 2 multipliers, 10 coefficient potentiometers, reference voltages, and a null system, the ±10 Volt Model 600 employs components and computing elements of better than 1% accuracy. Terminals are provided for external components to further expand the computing capability.

The software available includes an Operator's Handbook, a Maintenance Manual, and a Student Laboratory Manual containing 40 experiments. Accessories including X-Y Recorder and Patch Kit are also offered.

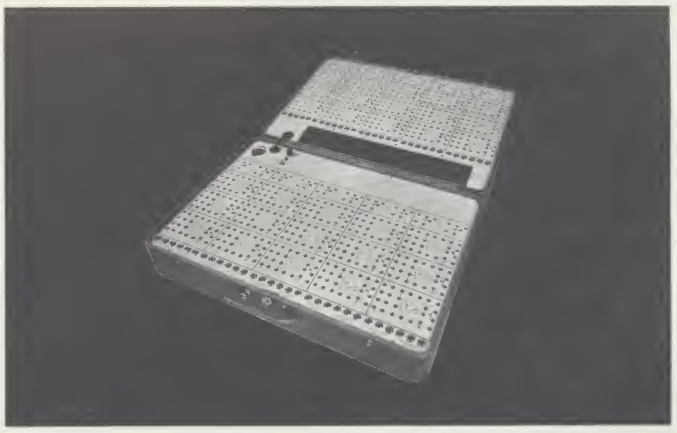
For a copy of our 12 page brochure or a demonstration of the Model 600 contact your nearest representative today.

GEOPHYSICAL INSTRUMENTS

Induced polarization instruments for field exploration and laboratory modeling in the Earth Sciences are the result of our five years of design and development at Burr-Brown. Widely used for the detection of disseminated mineralization associated with porphyry coppers, induced polarization has become the principal geophysical method employed in mineral exploration.

Standard products offered include: a transmitter capable of delivering up to 600 Volt-Amperes at four selectable frequencies from 0.05 to 5Hz; a receiver capable of reading voltages from 1 mV to 100 V full scale with selectable filtering in the range of 0.05 to 20 Hz; a precision square wave generator/voltage source for calibration of induced polarization receivers or for use as a laboratory reference; and a constant current pulse generator/receiver for laboratory or field measurements on rock samples.

For an 8 page brochure on Burr-Brown Induced Polarization Instruments, contact the Tucson office.



SPECIAL PURPOSE ANALOG COMPUTERS

Special Purpose Analog Computers for process control and instrumentation can be furnished in desk top, suitcase, or rack mounting configurations. The range of catalog and custom analog and hybrid modules available at Burr-Brown provide a broad and versatile base for the design and production of customer computers. Contact your nearest Burr-Brown representative for an economical hardware solution to your special requirements.

BURR-BROWN IS...

Burr-Brown Research Corporation is a steadily growing employee-owned company manufacturing quality electronic products in a new facility in Tucson's International Airport Industrial Park.

Started in 1956 as an Arizona Corporation with two employees and 400 square feet of space, the company has grown to over 200 employees and 32,000 square feet. Since introducing the first commercial line of solid state operational amplifiers, Burr-Brown has led the industry in the design and application of analog modules.

Burr-Brown's continuing success depends on its ability to provide your maximum value. Its employees are dedicated to this goal.

CHECK LIST OF BURR-BROWN SERVICES

JET STOCK SERVICE
Many of the popular operational amplifiers, connectors and accessories are available from your local Representative's "Jet Stock" inventory. Call your nearest Representative (see back page) today for immediate or overnight shipment of your order.

DEMONSTRATOR UNITS
Your evaluation of our products is encouraged. Contact your nearest Representative for a no cost demonstration of the units you desire.

APPLICATIONS CONSULTING
Burr-Brown and your local Representative have provided design consultation to hundreds of customers for thousands of applications of operational amplifiers and function modules. We are interested in receiving your inquiry.

RELIABILITY
Mean-time-to-failure (MTTF) and electrical stress analysis documents are available on all Burr-Brown amplifiers.

QUALITY ASSURANCE
Our quality control procedures are based upon MIL-Q-9858A, MIL-I-45208A, MIL-C-45662A, and NASA NPC-200-3 specifications. Request a copy of our Quality Control Manual; or if you prefer, we welcome your personal inspection of our facilities.

GUARANTEED SOURCE
Any product that we have ever manufactured is still available as a replacement item.

COMPLIMENTARY HANDBOOKS
Our two industry reference handbooks: Handbook of Operational Amplifier Active RC Networks (104 pages) and Handbook of Operational Amplifier Applications (96 pages), are available upon request.

YOUR MAXIMUM VALUE IS...
THE RIGHT PRODUCT, AT THE RIGHT PRICE, DELIVERED WHEN YOU NEED IT, BY THE COMPANY THAT GIVES YOU ALL THE NECESSARY SERVICES.

YOUR MAXIMUM VALUE

YOUR MAXIMUM VALUE STARTS *NOW...*

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BURR-BROWN

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OEM PRICE LIST
MARCH 1967

OPERATIONAL AMPLIFIERS

Model	(1-9)	(10-24)
1509/15	75.00	67.50
1510/25	95.00	85.50
1514/25	125.00	112.50
1520/15	45.00	40.50
1525/25	95.00	85.50
1527/25	135.00	121.50
1540/15	85.00	76.50
1541/25	115.00	103.50
1542/25	135.00	121.50
1543/15	125.00	112.50
1544/25	145.00	130.50
1545/25	165.00	148.50
1547/15	55.00	49.50
1548/25	165.00	148.50
1549/15	95.00	85.50
1552/15	95.00	85.50
1554/15	145.00	130.50
1555/25	175.00	157.50
1556/15	125.00	112.50
1557/15	65.00	58.50
1560/25	125.00	112.50
1634A/16	95.00	85.50
1643A/16	275.00	247.50
1644A/16	295.00	265.50

Model	(1-9)	(10-24)
1701/17	95.00	85.50
1706/17	95.00	85.50
1719/17	65.00	58.50
1752/17	125.00	112.50
1901/19	95.00	85.50
1902/19	85.00	76.50
1903/19	145.00	130.50
2901A/29	235.00	211.50
3001/15	65.00	58.50
3002/15	95.00	85.50
3003/15	95.00	85.50
3004/15	75.00	67.50
3005/15	60.00	54.00
3006/15	45.00	40.50
3007/15C	45.00	40.50
3008/15C	35.00	31.50
3009/15C	25.00	22.50
3010/25	175.00	157.50
3011/25	145.00	130.50
3012/25	125.00	112.50
3013/15	95.00	85.50
3014/15	60.00	54.00
3015/15	65.00	58.50

Model	(1-9)	(10-24)
3016/25	65.00	58.50
3017/25	65.00	58.50
3018/15	110.00	99.00
3019/15	80.00	72.00
3020/15	60.00	54.00
3021/15	45.00	40.50
3022/15	35.00	31.50

INSTRUMENTATION AMPLIFIERS

Model	(1-9)	(10-24)
1505B/15	95.00	85.50
1631A/16	195.00	175.50
1632A/16	155.00	139.50
1636/16	225.00	202.50
1660B/16	135.00	121.50

ALTERNATE MODULE TYPES

	(1-9)	(10-24)
/13	20.00	18.00
/16	30.00	27.00
/26	30.00	27.00

Add this alternate module price to the price for the basic module type, i.e., for one 1509/13 add the 1509/15 ($75.00) to the /13 ($20.00) for a $95.00 unit price.

FUNCTION MODULES

Model	Unit Price
1661/16	595.00
1662/16-2	625.00
1663/16	355.00
1664/16	295.00
1665/16	365.00
1666/16	295.00
1667/16	295.00
1668/16	295.00
1669/16	245.00

Model	Unit Price
1671/16	795.00
1673/16	425.00
1674/16	295.00
4001/40	675.00
4002/16	245.00
4002/26	245.00
4003/16	365.00
4003/26	365.00
4004/16	165.00

Model	Unit Price
4004/26	165.00
4006/25	295.00
4007/40	275.00
4008/40	275.00
5001/29	175.00
5002/29	195.00
9580/15	95.00
9635/25	125.00
9648/19	145.00

Model	Unit Price
9671/19	145.00
9859/15	75.00
9874/19	195.00
9875/19	195.00
9890/25	150.00
9892/25	125.00

1-9 units as shown, 10-24 less 10%

POWER SUPPLIES

Model	Unit Price
501	148.00
503A	280.00
505	148.00
506/16	340.00
506/26	280.00
507/16	380.00
507/26	320.00
508/16	480.00
508/26	420.00
509/16	480.00
509/26	420.00
521	148.00
525	148.00

DUAL REGULATORS

1515/25	95.00
1526/25	98.00

ACCESSORIES

Model	Unit Price
1300MC	2.00
1300FB	15.00
1300M	15.00
1300CS	35.00
1500MC	3.00
1500MC-1	3.00
1500FB	10.00
1500CS	25.00
1600MC	2.00
1600BP	2.00
1600M	25.00
1600M-2	35.00
1600CE	30.00
1600-7R	50.00
1600-16R	80.00
1600-16RW	100.00

Model	Unit Price
1700MC	3.00
1700AP	6.00
1700AP-1	6.00
1900MC	3.00
1900MC-1	3.00
1900AP	6.00
2600MC	2.00
2600M	25.00
2600-16R	80.00
Amphenol 143-012-01	2.00
Burndy EC4206P5	2.00

1-9 units as shown, 10-24 less 10%

Printed in U.S.A.

Release 277E 3/67

REPLACEMENT UNITS

(1-9 units as shown, 10 or more contact factory)

Model	Unit Price
100	127.00
110	155.00
211B	445.00
300	228.00
502	520.00
503	280.00
1303	98.00
1304	95.00
1305	125.00
1305A	115.00
1306A	140.00
1313	75.00
1318A	75.00
1340	155.00
1340A	130.00
1360B	165.00
1391	125.00
1501	85.00
1502	75.00
1503	95.00
1504	98.00
1505A	135.00
1506	85.00
1507	65.00
1508	110.00
1511	65.00
1512	55.00
1516	45.00
1517	35.00
1518	45.00
1519	50.00
1538A	175.00
1500JS	2.00

Model	Unit Price
1600-10R	380.00
1600-12R	340.00
1602	150.00
1604	190.00
1605	165.00
1605A	165.00
1606A	125.00
1607A	195.00
1607B	155.00
1608	195.00
1608A	195.00
1614A	150.00
1618	235.00
1628	235.00
1633	175.00
1634	95.00
1635	225.00
1638	210.00
1641	175.00
1642	195.00
1643	275.00
1644	295.00
1648	295.00
1660A	175.00
1940	125.00
1952	165.00
2600-504	246.00
2628	235.00

Burndy EC4535 - no longer available, interchangeable with Burndy EC4206P5.

TRY OUR JET STOCK SERVICE!

SAME DAY SHIPMENT from your local representative's JET STOCK of many of these operational amplifiers, connectors and accessories is provided for your prototype design needs. Contact your nearest U.S. representative.

PRICES

As shown in U.S. dollars. Subject to change without notice.

DISCOUNT STRUCTURE

1-9	Net
10-24	10%
25 up	Contact the Tucson office or your nearest representative. (See other side.)

TERMS

Net 30 days

FOB POINT

Tucson, Arizona

DELIVERY (SEE JET STOCK)

All units shown are normally in stock in Tucson. Larger quantity shipment rarely exceeds three weeks. For fast delivery of larger quantities, it is advisable to phone the Tucson office.

METHOD OF SHIPMENT

Units will be shipped parcel post in the absence of a specific request to the contrary. When time is critical, we recommend air parcel post, air express, or air freight.

ALTERNATE PACKAGES

Any of the encapsulated amplifiers can be supplied in any of three different shielded metal enclosures. In ordering add a /13, /16 or /26 to denote the desired package, i.e., to order a Model 3003/15 in either a /13, /16 or /26 package, specify 3003/13, 3003/16 or 3003/26. Prices are the basic price of the encapsulated amplifier plus $20 for a /13 enclosure and $30 for /16 or /26 enclosure. Custom packages available on special order.

REPLACEMENT PRODUCTS

All products that were ever manufactured by Burr-Brown are generally available on special order. Model numbers with an alphabetical suffix are improvements of and interchangeable with earlier models having the same model number. Contact the Tucson office or your nearest representative for a quotation.

QUOTATIONS

Quotations, which are firm for sixty days, are furnished upon request. An annual purchase agreement may be arranged for your continuing requirements.

REPRESENTED BY:

BB

BURR-BROWN

RESEARCH CORPORATION

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